General Comments: Manufacturer claims that construction of box will ensure corrosion-free operation and will enable sampler to operate at sub-zero temperatures with the addition of user-supplied heater. Box cover is insulated with styrofoam blanket. Box is designed to hold 10 wide-mouth 3.7ℓ (1 gal) sample jars which must be supplied by the user. A threaded stainless steel driving shaft and plastic trough are used to deliver sample to jars sequentially. Manufacturer notes that samples will not be representative as regards solids content.

Noascono Automatic Shift Sampler Evaluation

1. Obstruction or clogging will depend upon user installation of intake line; peristaltic pump can tolerate solids, but tubing is rather small.

2. Obstruction to flow will depend upon user mounting of intake line.

3. Should operate over all flow-conditions but extremely low intake velocity will affect representativeness of sample at all flow rates.

4. Movement of solids within the fluid flow should not affect operation adversely.

5. No automatic starter; no self-cleaning features.

6. Unit sequentially fills user supplied sample containers from very small, continuous stream. Pump speed is adjustable.

7. Unit does not appear suitable for collecting either floatables or coarser bottom solids.

8. Unit offers some sample protection, but offers no refrigeration.

9. Not designed for confined space or manhole operation.

10. Cannot withstand total immersion.

11. Unit offers reasonable protection for operation in freezing ambients due to insulated box cover if heating element is installed by user. Intake line could freeze unless also protected.

12. Maximum lift of 9m (30 ft) does not place much operating restriction on unit.

Designation:	N-CON SURVEYOR II MODEL
Manufacturer:	N-Con Systems Company, Inc. 308 Main Street New Rochelle, New York 10801 Phone (914) 235-1020
Sampler Intake:	End of 1.3 cm (1/2 in.) sampling tube installed to suit by user.
Gathering Method:	Suction lift by self-priming flexible impeller pump.
Sample Lift:	1.8m (6 ft) maximum.
Line Size:	0.64 cm (1/4 in.) I.D. line connects diverter to sample container.
Sample Flow Rate:	20 ℓpm (5 gpm).
Sample Capacity:	Aliquot size adjustable from approximately 150 mℓ to 5000 mℓ; composited in user supplied container, 7.6ℓ (2 gal) jug to 208ℓ (55 gal) drum.
Controls:	Timer may be set to collect from 3 to 20 samples per hour; may also be paced by either pulse duration or totalizer signals from external flowmeter.
Power Source:	115 VAC.
Sample Refrigerator:	115 VAC/12 VDC refrigerator which can hold either one 7.6ℓ (2 gal) or two 3.8ℓ (1 gal) bottles available.
Construction Materials:	Sampling train is PVC, nylon, epoxy resin, and Buna-N.
Basic Dimensions:	28 x 20 x 25 cm (11 x 8 x 10 in); weighs 6.8 kg (15 lbs); portable.
Base Price:	$290; add $280 for refrigerator, $20 for flow proportional hook-up.
General Comments:	When sample is to be collected, the self-priming pump operates for a preset period of time which determines the volume of the sample.

Approximately 15% of the pump's throughput is diverted to the sample receiver by a fluidic diverter. When the pump stops the fall of liquid level in the exhaust line backwashes to help prevent clogging. User must supply reinforced garden hose lines for sample intake and return and sample container.

N-Con Surveyor II Model Evaluation

1. Unit would not appear to be vulnerable to clogging, except possibly at diverter fittings.

2. Will depend upon way user mounts end of sampling tube.

3. Should operate reasonably well under all flow conditions.

4. Movement of solids should not hamper operation.

5. No automatic starter. Fall of liquid in exhaust line when pump stops will backwash giving a sort of self-cleaning action.

6. Can collect either timer or flowmeter paced samples and composite them in a suitable container. Representativeness of sample will depend upon user mounting of intake tube.

7. Unsuitable for collection of samples of floatables and coarser bottom solids without specially designed intake by user.

8. Automatic refrigerator available as option. Small amount of cross contamination might be experienced.

9. Should be able to operate in manhole enviroment.

10. Cannot withstand immersion.

11. Not ideally suited for operation in freezing ambients.

12. Maximum lift of 6 feet limits location of unit.

Designation:	N-CON SCOUT II MODEL
Manufacturer:	N-Con Systems Company, Inc. 308 Main Street New Rochelle, New York 10801 Phone (914) 235-1020
Sampler Intake:	Plastic strainer approximately 5 cm (2 in.) diameter x 20 cm (8 in.) long and perforated with 0.3 cm (1/8 in.) holes.
Gathering Method:	Suction lift by peristaltic pump.
Sample Lift:	Up to 5.5 m (18 ft).
Line Size:	0.64 cm (1/4 in.) I.D.
Sample Flow Rate:	150 mℓ per minute.
Sample Capacity:	Aliquot size is adjustable via a solid state timer to suit hydraulics of installation and sampling programs; composited in a 3.8ℓ (1 gal) container.
Controls:	All solid state controller in moisture-proof enclosure has function switch for test, reset and set, and purge selection (before, after, or both before and after sample collection), sample volume setting knob, on/off switch, and samples per hour switch (1, 2, 4, or 8 per hour or one sample every 1, 2, or 3 hours). Float switch automatically shuts unit off when sample container is full. Unit may also be paced by any flow totalizer providing a momentary contact closure every preset number of gallons.
Power Source:	115 VAC or internal 12 VDC solid-gel battery.
Sample Refrigerator:	115 VAC/12 VDC refrigerator which can hold either one 7.6ℓ (2 gal) or two 3.8ℓ (1 gal) bottles available.

Construction Materials:	Sampling train PVC, silicone rubber, polyethylene; case is compression molded fiberglass, stainless steel hardware.
Basic Dimensions:	36 x 15 x 43 cm (14 x 6 x 17 in.); weighs 10 kg (22 lbs); portable.
Base Price:	$575; solid-gel battery is $42, charger is $38, automatic refrigerator is $280.
General Comments:	Optional refrigerator is absorption-type, measures 43 x 43 x 38 cm (17 x 17 x 15 in.), and weighs 9.5 kg (21 lbs). Case is weatherproof.

N-Con Scout II Model Evaluation

1. Peristaltic action of pump should reduce probability of clogging.

2. Obstruction of flow will depend upon way user mounts intake.

3. Should operate reasonably well over all flow conditions, but fairly low intake velocity could affect representativeness of sample at high flow rates.

4. Movement of solids should not hamper operation.

5. No automatic starter. Three purge modes are switch-selectable to help minimize cross-contamination and offer a sort of self-cleaning.

6. Unit collects preset size aliquots at either preset time intervals or as paced by external flowmeter and composites them in container. Representativeness of sample will depend upon user mounting of intake tube.

7. Unit does not appear suitable for collecting floatables or coarser bottom solids.

8. Refrigeration optional. Reasonably good sample protection (container is connected only to pump). Cross-contamination should be small.

9. Designed to operate in manhole environment.

10. Cannot withstand total immersion.

11. Not suited for operation in freezing environments.

12. Maximum lift of 5.5m (18 ft) places small restriction on use of unit.

Designation:	N-CON SENTRY 500 MODEL
Manufacturer:	N-Con Systems Company, Inc. 308 Main Street New Rochelle, New York 10801 Phone (914) 235-1020
Sampler Intake:	Plastic strainer approximately 5 cm (2 in.) diameter x 20 cm (8 in.) long and perforated with 0.3 cm (1/8 in.) holes.
Gathering Method:	Suction lift by peristaltic pump.
Sample Lift:	Up to 5.5m (18 ft).
Line Size:	0.64 cm (1/4 in.) I.D.
Sample Flow Rate:	150 mℓ per minute.
Sample Capacity:	Collects 24 sequential composite 500 mℓ samples made up of from 2, 4, or 8 individual aliquots over a period of 3 to 72 hours.
Controls:	Same as Scout II Model plus bottles per hour switch adjustable from 8 bottles per hour to 1 bottle in 3 hours.
Power Source:	115 VAC or internal 12 VDC solid-gel battery.
Sample Refrigerator:	Available as option.
Construction Materials:	Same as Scout II, but glass sample jars (clear styrene optional) and aluminum case with baked-on synthetic enamel finish.
Basic Dimensions:	37 x 37 x 56 cm (14.5 x 14.5 x 22 in.); weighs 17.7 kg (39 lbs) portable.
Base Price:	$1,125; solid-gel battery is $42, charger is $38.

General Comments: Similar in operation to the Scout Model except for capability to collect discrete samples. Sampler automatically shuts off after 24th bottle is filled. Twin doors provide easy access at both front and rear of case. Sample distribution tray slides out for easy cleaning without disturbing other components. A second pump head may be easily field installed, providing the ability to collect a single as well as sequential composite sample simultaneously or to sample at different levels in the flow or from two different sources simultaneously.

N-Con Sentry 500 Model Evaluation

1. Peristaltic action of pump should reduce probability of clogging.

2. Obstruction of flow will depend upon way user mounts intake.

3. Should operate reasonably well under all flow conditions, but fairly low intake velocity could affect representativeness of sample at high flow rates.

4. Movement of solids should not hamper operation.

5. No automatic starter. Three purge modes are switch-selectable to help minimize cross-contamination and offer a sort of self-cleaning.

6. Unit collects 24 sequential composite samples made up of 2 to 8 individual aliquots at preset time intervals or as paced by external flowmeter. Representativeness of sample will depend upon user mounting of intake tube.

7. Unit does not appear suitable for collection of floatables or coarser bottom solids.

8. Refrigeration optional. Reasonably good sample protection. Cross-contamination should be small.

9. Designed to operate in manhole environment.

10. Cannot withstand total immersion.

11. Not suited for operation in freezing environments.

12. Maximum lift of 5.5m (18 ft) places small restriction on use of unit.

Designation:	N-CON SENTINEL MODEL
Manufacturer:	N-Con Systems Company, Inc. 308 Main Street New Rochelle, New York 10801 Phone (914) 235-1020
Sampler Intake:	Provided by user; sampler has standard 5 cm (2 in.) pipe inlet.
Gathering Method:	External head to provide flow through a sampling chamber from which an oscillating dipper (after McGuire and Stormgaard) extracts a sample aliquot and transfers it to a funnel where it is gravity fed to a composite bottle.
Sample Lift:	Not applicable.
Line Size:	Smallest line in sampling train is the one connecting the funnel to the sample bottle; it appears to be about 2.5 cm (1 in.).
Sample Flow Rate:	38 to 189 ℓpm (10 to 50 gpm).
Sample Capacity:	Sampling dipper collects a 25 mℓ aliquot; a 7.6ℓ (2 gal) composite container is provided.
Controls:	Constant rate sampling (between 3 and 20 samples per hour) is controlled by built-in timer; flow proportional composites are collected by connecting to the electrical output of a pulse duration or integrating external flowmeter.
Power Source:	115 VAC electricity
Sample Refrigerator:	Automatic refrigerator to maintain sample at 4° to 10°C is available.
Construction Materials:	PVC and polyethylene.
Basic Dimensions:	56 x 71 x 147 cm (22 x 28 x 58 in.). Designed for fixed installation. Weighs 83.9 kg (185 lbs).

Base Price:	Around $2,600 with refrigerator.
General Comments:	Manufacturer claims representative samples assured due to design of sample chamber which causes thorough mixing of liquid before it flows over adjustable weir.

N-Con Sentinel Model Evaluation

1. Should be free from clogging. Sampling intake must be designed by user.
2. Sampler itself offers no flow obstruction.
3. Should operate well over entire range of flow conditions.
4. Movement of solids should not hamper operation.
5. Designed for continuous operation; no automatic starter. Continuous flow serves a self cleaning function and should minimize cross contamination.
6. Can collect either flow proportional or fixed time interval composites. Representativeness of sample will be a function of sample intake which is not a part of this unit.
7. Collection of floatables and coarser bottom solids will depend upon design of sampling intake.
8. Automatic refrigeration maintains samples at 44° to 10°C. Offers good sample protection and freedom from precontamination.
9. Not designed for confined space or manhole operation.
10. Cannot withstand total immersion.
11. Does not appear capable of prolonged exposure to extremely cold ambient conditions.
12. Operating head is provided by user.

Designation:	N-CON TREBLER MODEL
Manufacturer:	N-Con Systems Company, Inc. 308 Main Street New Rochelle, New York 10801 Phone (914) 235-1020
Sampler Intake:	Specially designed scoop.
Gathering Method:	Mechanical; oscillating scoop is lowered into the channel traversing entire depth of flow, then returned to its raised position, draining the collected sample by gravity through a swivel fitting coaxial with the hub into a sample container.
Sample Lift:	Unit must be in flow stream.
Line Size:	1.3 cm (1/2 in.) diameter pipe connects hub to sample container.
Sample Flow Rate:	Not applicable.
Sample Capacity:	Scoop is shaped to gather a volume of liquid that is proportional to the channel flow; can vary typically from 200 to 600 mℓ when installed in a Parshall flume.
Controls:	Electric timer may be set to take from 3 to 20 samples per hour.
Power Source:	115 VAC electricity
Sample Refrigerator:	Automatic refrigerator available which provides 4° to 10°C sample storage.
Construction Materials:	Cast aluminum frame and cover; PVC scoop, plastic pipe.
Basic Dimensions:	Approximately 0.6 to 0.9m (2 to 3 ft) of headroom is required. Other dimensions depend upon size of flume or weir. Refrigerator case is 61 x 66 x 76 cm (24 x 26 x 30 in.). Designed for fixed installation.

Base Price:	$1,050; add $300 for refrigerator.
General Comments:	Drive mechanism and control programmer are totally enclosed and weatherproof, with no exposed chains or sprockets. Oscillating action of scoop permits installation in smaller weir boxes and manholes and lessens the chances of fouling with rags, etc., or being damaged by floating debris. Must operate in conjunction with a weir or Parshall flume.

N-Con Trebler Model Evaluation

1. Scoop is not likely to pick up any solids large enough to clog sample line.
2. Scoop presents an obstruction over the entire depth of flow during sampling cycle.
3. Scoop must be designed for range of flows anticipated in conjunction with flume. This range has certain limitations.
4. Movement of solids could interfere with scoop rotation; abrasive wear on rigid, high impact PVC scoop should not be too great.
5. No automatic starter; no self cleaning features.
6. Collects a sample for compositing from throughout the entire depth of flow that is proportional to depth and hence flow rate through the flume.
7. Will afford some capability of sampling floatables as well as bottom solids.
8. Standard unit has no sample container. Optional refrigerator would appear to offer reasonable protection.
9. Designed for operation in the flow stream, but requires a Parshall flume for best operation which would rule out most manholes.
10. Unit cannot withstand total immersion.

11. Unit is not designed to operate in freezing ambients.

12. Unit must be in flow stream to function.

Designation:	PERI PUMP MODEL 704
Manufacturer:	The Peri Pump Company Ltd. 180 Clark Drive Kenmore, New York 14223 Phone (716) 875-7955
Sampler Intake:	Weighted screen at end of 1.8m (6 ft) long suction tube installed to suit by user.
Gathering Method:	Suction lift from peristaltic pump.
Sample Lift:	Designed to operate between 1.2 and 1.8m (4 and 6 ft); Manufacturer claims, however, that pump is capable of lifting over 7.6m (25 ft) although at reduced output.
Line Size:	Appears to be about 0.64 cm (1/4 in.) I.D.
Sample Flow Rate:	Approximately 160 mℓ per minute.
Sample Capacity:	Fixed size (approx. 40 mℓ) aliquots are taken every 15 minutes and composited in a 3.8ℓ (1 gal) container.
Controls:	On/off switch.
Power Source:	Two 12 VDC dry-cell batteries.
Sample Refrigerator:	None
Construction Materials:	Sample train is PVC and silicon. Case is aluminum with rubber sealed door and epoxy-sealed controls and is painted with an acrylic lacquer.
Basic Dimensions:	49 x 37 x 30 cm (16x12x10 in.); weighs 11.3 kg (25 lbs); portable.
Base Price:	Not available at time of writing.

General Comments: An overflow tube is connected to the container in case the unit is left longer than 24 hours. Aliquot size is a function of lift.

Peri Pump Model 704 Evaluation

1. Peristaltic action of pump should reduce probability of clogging.

2. Obstruction of flow will depend upon user mounting of intake.

3. Should operate reasonably well under all flow conditions, but fairly low intake velocity could affect representativeness of sample at high flow rates.

4. Movement of solids should not affect operation adversely.

5. No automatic starter; no self-cleaning features.

6. Unit takes fixed time interval samples paced by a built-in timer and composites them in a suitable container.

7. Unit does not appear suitable for collecting either floatables or coarser bottom solids.

8. Unit offers reasonable sample protection, but offers no refrigeration. Cross-contamination appears very likely.

9. Unit is designed for manhole operation.

10. Unit cannot withstand total immersion.

11. Unit cannot withstand freezing ambients.

12. Designed for operation at between 1.2 and 1.8m (4 and 6 ft) lift, which limits location of unit. Greater lifts are possible but with reduced aliquot size.

Designation:	PHIPPS AND BIRD DIPPER-TYPE
Manufacturer:	Phipps and Bird, Inc. 303 South 6th Street Richmond, Virginia 23205 Phone (703) 644-5401
Sampler Intake:	Dipping bucket.
Gathering Method:	Mechanical; dipper on sprocket-chain drive.
Sample Lift:	Up to 3m (10 ft) standard, longer on special order.
Line Size:	Not applicable.
Sample Flow Rate:	Not applicable.
Sample Capacity:	Dipping bucket holds 200 mℓ; user supplies sample composite container to suit.
Controls:	Sampling cycle can either be started at fixed, selected intervals from a built-in timer (15 minutes) or in response to signals from an external integrating flowmeter. Test switch.
Power Source:	115 VAC or 12 VDC electricity.
Sample Refrigerator:	Optional refrigerator, with wide mouth sample intake (to match sampler discharge trough) leading to custom sampler container, will maintain sample between 4-10°C.
Construction Materials:	Dipper and funnel are stainless steel; sprockets and chain are steel (stainless available), supports are angle iron.
Basic Dimensions:	Lower portion of unit will pass through a 30.5 cm (12 in.) diameter opening; base is 41 x 61 cm (16 x 24 in.) and entire unit will pass through a 76 cm (30 in.) diameter opening; unit extends 0.9m (3 ft) above base. Fixed installation.

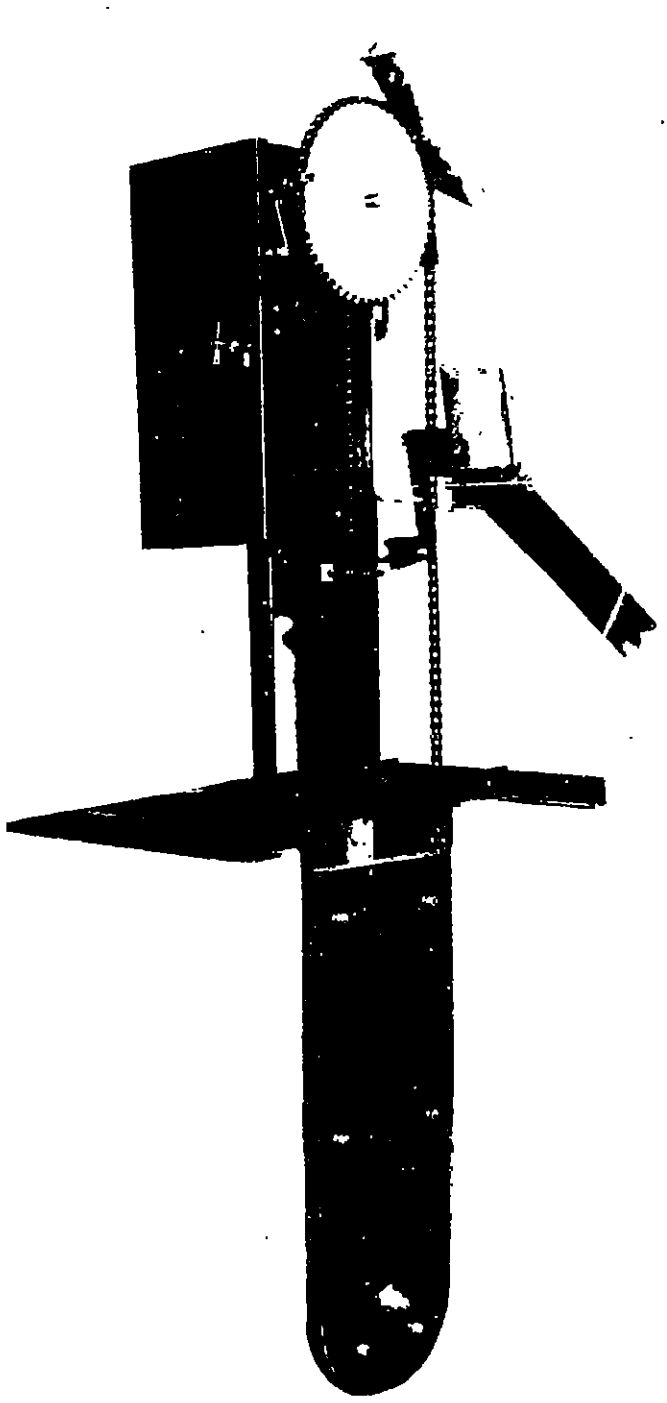

Figure 11. Phipps and Bird Dipper-Type Sampler

Photograph courtesy of Phipps and Bird, Inc.

Base Price:	$725; $1,145 in stainless steel; $1,980 for explosion proof version: $2,450 for explosion proof version in stainless steel; refrigerator is $325.
General Comments:	Manufacturer states unit was designed to sample trash laden streams where it is not possible to operate a pump. A circuit breaker prevents damage if unit becomes jammed.

Phipps and Bird Dipper-Type Evaluation

1. Clogging of sampling train is unlikely; however, the exposed chain-sprocket drive is vulnerable to jamming by rags, debris, etc.
2. Unit provides a rigid obstruction to flow.
3. Unit should operate over full range of flows.
4. Movement of solids could jam unit.
5. No automatic starter; no self-cleaning features.
6. Collects fixed size aliquots paced by built-in timer or external flowmeter and composites them in a suitable container.
7. Does not appear well suited for collecting either floatables or coarser bottom solids.
8. No sample collector provided.
9. Unit is capable of manhole operation.
10. Unit is not weatherproof; cannot withstand total immersion.
11. Unit is not suitable for prolonged operation in freezing ambients.
12. Unit would appear impractical for very long lifts (say above 18.3m (60 ft).

Designation:	PROTECH MODEL CG-110
Manufacturer:	Protech, Inc. Roberts Lane Malvern, Pennsylvania 19355 Phone (215) 644-4420
Sampler Intake:	Plastic sampling chamber (about 5 cm diameter) with two rows of 0.3 cm (1/8 in.) diameter ports around the circumference. Weighted bottom caps are available to keep the intake screen off the bottom.
Gathering Method:	Forced flow due to pneumatic ejection.
Sample Lift:	Standard maximum is 9.1m (30 ft).
Line Size:	0.32 cm (1/8 in.) I.D.
Sample Flow Rate:	Less than 1 ℓpm; depends upon pressure setting and lift.
Sample Capacity:	Sample chamber volumes of 25, 50, 75, or 100 mℓ; composited in user supplied container.
Controls:	Sampling frequency is determined by a built-in ratemeter and fluidic accumulator timing circuit. Sampling interval adjustable from 2 to 60 minutes. On-off valve for control of external pressure source. Standard 50 mℓ sample chamber has removable 25 mℓ plug.
Power Source:	Requires external pressure source such as refrigerant type of propellant, nitrogen or compressed air.
Sample Refrigerator:	Available as an option.

Construction Materials:	All components in sampling train are TFE resins, PVC, and nylon. Case is heavy duty aluminum with baked vinyl finish.
Basic Dimensions:	33 x 23 x 30 cm (13x9x12 in.); weighs 7.3 kg (16 lbs); portable.
Base Price:	$485.
General Comments:	Model is explosion proof. No battery or electrical lines needed. Propellant consumption is approximately equivalent to 150-170 samples per 0.45 kg (1 lb) of R-12 refrigerant. Optionally available are TFE sample chamber and tubing for sampling oily or sticky liquids, puncturing valve for propellant in sealed refrigerant cans, short unweighted bottom cap for sample chamber, and a portable refrigerator.

Protech Model CG-110 Evaluation

1. Sampling train is unobstructed 0.32 cm (1/8 in.) I.D. passageway which will pass small solids. No pump to clog.

2. Obstruction to flow will depend upon user mounting of intake.

3. Sampling chamber will fill immediately following discharge of previous aliquot. Circulation of flow through chamber would appear to be limited, resulting in a sample not necessarily representative of conditions in the sewer at the time of the next triggering signal. Representativeness is also questionable at high flow rates.

4. Movement of solids should not hamper operation.

5. No automatic starter. A self-cleaning feature of sorts in the sampling chamber is accomplished by the two-way flushing action which occurs during each filling and pressurizing cycle.

6. Collects spot samples at preset time intervals and composites them in a suitable container.

7. Appears unsuitable for collection of either floatable materials or coarser bottom solids.

8. Portable refrigerator available as an option to refrigerate sample containers. Some cross-contamination appears likely.

9. Designed for manhole operation.

10. Case is weatherproof but will not withstand total immersion.

11. Unit is not suited for operation in freezing ambients.

12. Upper lift limit of 9.1m (30 ft) does not pose a severe restriction on operating head conditions.

Designation:	PROTECH MODEL CG-125
Manufacturer:	Protech, Inc. Roberts Lane Malvern, Pennsylvania 19355 Phone (215) 644-4420
Sampler Intake:	Plastic sampling chamber (about 5 cm diameter) with two rows of 0.3 cm (1/8 in.) diameter ports around the circumference. Weighted bottom caps are available to keep the intake screen off the bottom.
Gathering Method:	Forced flow due to pneumatic ejection.
Sample Lift:	Standard maximum is 9.1m (30 ft).
Line Size:	0.32 cm (1/8 in.) I.D.
Sample Flow Rate:	Less than 1 ℓpm (1/4 gpm); depends upon pressure setting and lift.
Sample Capacity:	Sample chamber volumes from 25 to 250 mℓ available; sample composited in suitable container, 5.8ℓ (1.5 gal) jug available.
Controls:	Sampling frequency is determined by metering gas pressure (via a rotometer with a vernier needle valve and two float balls) into a surge tank until a preset pressure, normally 1 kg/sq cm (15 psi), is reached, whereupon a pressure controller releases the gas, a 0.14 kg/sq cm (2 psi) differential, to the sample chamber forcing the sample up to the sample bottle and blowing the lines clear. The higher the gas flow rate the higher the sampling frequency. Sampling frequency is adjustable from two minutes to one hour.
Power Source:	Three 0.45 kg (1 lb) cans of refrigerant on a common manifold inside the case is standard; compressed air or nitrogen can also be used.

Sample Refrigerator:	Portable refrigerator (110 VAC or 12 VDC) with capacity for one 5.8ℓ (1.5 gal) or two 3.8ℓ (1 gal) sample containers available.
Construction Materials:	All components in sampling train are TFE resins, PVC, and nylon. Case is aluminum, gas valves and fittings are of brass and copper.
Basic Dimensions:	33 x 25 x 43 cm (13 x 10 x 17 in.) standard; deep case large enough to hold a 5.8ℓ (1.5 gal) sample container and winterizing kit is available. Standard unit weighs 14 kg (31 lbs) total; portable.
Base Price:	$695 for basic unit including 50 mℓ sample chamber, 6 cans of refrigerant, and two 9m (30 ft) lengths of tubing. Add $75 for deep case; $140 for winterizing kit; $20 for 100 mℓ or $80 for 250 mℓ sample chamber; $275 for refrigerator. Two high-lift, to 91m (300 ft), models are available; CG-170 at $870 offers continuously adjustable lift, while CG-190 at $890 has convertible high/low lift.
General Comments:	Standard model is explosion proof, no battery or electrical power is required. Manufacturer claims unit will sample up to 1/8" diameter solids. Check valve in sample chamber is self-cleaning. Self-cleaning feature is accomplished by the two-way flushing action which occurs during each filling and pressurizing cycle. A flow splitter provides 1 to 2, 1 to 1, or 2 to 1 ratio of sample flow to waste return flow. Three cans of refrigerant allow taking up to 250 aliquots. Winterizing is accomplished using strip heaters operated by an automatic temperature control.

Protech Model CG-125 Evaluation

1. Sampling train is unobstructed 0.32 cm (1/8 in.) I.D. passageway which will pass small solids. No pump to clog.

2. Obstruction to flow will depend upon user mounting of intake.

3. Sampling chamber will fill immediately following discharge of previous aliquot. Circulation of flow through chamber would appear to be limited, resulting in a sample not necessarily representative of conditions in the sewer at the time of the next triggering signal. Representativeness is also questionable at high flow rates.

4. Movement of solids should not hamper operation.

5. No automatic starter. A self-cleaning feature of sorts in the sampling chamber is accomplished by the two-way flushing action which occurs during each filling and pressurizing cycle.

6. Collects spot samples at preset time intervals and composites them in a suitable container.

7. Appears unsuitable for collection of either floatable materials or coarser bottom solids.

8. Refrigeration is available as an option. Deep case version offers reasonable sample protection. Some cross-contamination appears likely.

9. Unit is designed for manhole operation.

10. Case is weatherproof but will not withstand total immersion.

11. Can operate in freezing ambients if fitted with optional winterizing kit.

12. Standard upper lift limit of 9.1m (30 ft) does not pose a great restriction on operating head conditions; high lift versions have virtually no restriction.

Designation:	PROTECH MODEL CG-125FP
Manufacturer:	Protech, Inc. Roberts Lane Malvern, Pennsylvania 19355 Phone (215) 644-4420
Sampler Intake:	Plastic sampling chamber (about 5 cm diameter) with two rows of 0.3 cm (1/8 in.) diameter ports around the circumference. Weighted bottom caps are available to keep the intake screen off the bottom.
Gathering Method:	Forced flow due to pneumatic ejection.
Sample Lift:	Standard maximum is 9.1m (30 ft).
Line Size:	0.32 cm (1/8 in.) I.D.
Sample Flow Rate:	Less than 1 ℓpm (1/4 gpm); depends upon pressure setting and lift.
Sample Capacity:	Sample chamber volumes from 25 to 250 mℓ available; sample composited in suitable container, 5.8ℓ (1.5 gal) jug available.
Controls:	Can take samples at preset time intervals in same way as Model CG-125. For flow proportional sampling a normally closed, solenoid operated valve in the gas inlet opens momentarily on receiving an impulse from an external flow registering device. The sampling frequency is determined by the frequency and duration of these impulses and the rotometer setting. Thus the intermittent flow signal impulses are translated into fluidic impulses that are accumulated in the surge tank which serves as a totalizer. If the flow proportional signal is supplied by a totalizer and it is desired to take one sample per impulse, a solid state timer is available

	which will hold the solenoid open long enough to accumulate the necessary pressure.
Power Source:	115 VAC or 6 VDC; three 0.45 kg (1 lb) cans of refrigerant on a common manifold inside the case is standard; compressed air or nitrogen can also be used.
Sample Refrigerator:	Optional as with CG-125.
Construction Materials:	All components in sampling train are TFE resins, PVC, and nylon. Case is aluminum, gas valves and fittings are of brass and copper.
Basic Dimensions:	Same as Model CG-125.
Basic Price:	$925 for basic unit; add $250 for solid state timer, other accessories priced as for Model CG-125.
General Comments:	Basically a flow proportional version of Model CG-125. Completely portable in battery version. Control solenoid is certified by UL for use in hazardous areas.

Protech Model CG-125FP Evaluation

1. Sampling train is unobstructed 0.32 cm (1/8 in.) I.D. passageway which will pass small solids. No pump to clog.

2. Obstruction to flow will depend upon user mounting of intake.

3. Sampling chamber will fill immediately following discharge of previous aliquot. Circulation of flow through chamber would appear to be limited, resulting in a sample not necessarily representative of conditions in the sewer at the time of the next triggering signal. Representativeness is also questionable at high flow rates.

4. Movement of solids should not hamper operation.

5. No automatic starter. A self-cleaning feature of sorts in the sampling chamber is accomplished by the two-way flushing action which occurs during each filling and pressurizing cycle.

6. Collects spot samples at either preset time intervals or paced by an external flowmeter and composites them in a suitable container.

7. Appears unsuitable for collection of either floatable materials or coarser bottom solids.

8. Refrigeration is available as option. Some cross-contamination appears likely. Deep case version offers reasonable sample protection.

9. Unit is designed for manhole operation.

10. Case is weatherproof but will not withstand total immersion.

11. Can operate in freezing ambients if fitted with optional winterizing kit.

12. Standard upper lift limit of 9.1m (30 ft) does not pose a great restriction on operating head conditions.

Designation:	PROTECH MODEL CEG 200
Manufacturer:	Protech, Inc. Roberts Lane Malvern, Pennsylvania 19355 Phone (215) 644-4420
Sampler Intake:	Plastic 250 mℓ sampling chamber with 4 removable 50 mℓ plugs.
Gathering Method:	Forced-flow due to pneumatic ejection.
Sample Lift:	Standard maximum is 16.8m (55 ft).
Line Size:	Smallest line is 0.32 cm (1/8 in.) I.D.
Sample Flow Rate:	Less than 1 ℓpm (1/4 gpm); depends upon pressure setting and lift.
Sample Capacity:	Aliquots taken by 250 mℓ sample chamber with 4 removable 50 mℓ plugs are composited in a 5.8ℓ (1.5 gal) sample container.
Controls:	Sampling interval and duration are controlled individually (6 seconds to 60 hours) from panel with visible countdown. Samples can be taken by propellant from an external pressure source, or by internal air compressor for continuous use or standby. Accepts signals by preset timer or from external flowmeter signal. Purging time is controllable via sample duration timer. Higher lift than standard is available by resetting internal pressure regulator.
Power Source:	115 VAC and propellant from an external pressure source such as nitrogen, compressed air, or refrigerant.

Sample Refrigerator:	Noiseless absorption type available as an option with capacity for one 5.8ℓ (1.5 gal) or two 3.8ℓ (1 gal) sample containers. An aluminum stand is also available to support the refrigerator on a shelf below the sampler. Stationary models accommodate the refrigerator within cabinet.
Construction Materials:	All components in sampling train are TFE resins, PVC, and nylon. Case is aluminum.
Basic Dimensions:	Portable - 33 x 48 x 43 cm (13x19x17 in.), weighs 18 kg (40 lbs) total; Stationary indoor- 69 x 66 x 127 cm (27x26x50 in.), weighs 107 kg (235 lbs) total; Stationary outdoor - 76 x 66 x 152 cm (30x26x60 in.), weighs 118 kg (260 lbs) total.
Base Price:	$1,345 (portable), $1,990 (stationary indoor), and $2445 (stationary outdoor); all include 250 mℓ sample chamber, 15.2m (50 ft) each of 0.64 cm (1/4 in.) O.D. and 1.3 cm (1/2 in.) O.D. tubing, and 5.8ℓ (1.5 gal) sample container. For portable model add $275 for refrigerator, $140 for winterizing kit, and $75 for aluminum stand to hold sampler above container or refrigerator.
General Comments:	Manufacturer claims unit has high-solids capability for sampling industrial and sewage wastes. Sample lines are purged of liquid after each sample is taken. A seven-day programming clock for stationary models programs operation in selected 15-minute increments; available at $195.

Protech Model CEG 200 Evaluation

1. Sampling train is unobstructed 0.32 cm (1/8 in.) I.D. passageway which will pass small solids. No pump to clog.

2. Obstruction to flow will depend upon user mounting of intake.

3. Sampling chamber will fill immediately following discharge of previous aliquot. Circulation of flow through chamber would appear to be limited, resulting in a sample not necessarily representative of conditions in the sewer at the time of the next triggering signal. Representativeness is also questionable at high flow rates.

4. Movement of solids should not hamper operation.

5. No automatic starter. Self-cleaning in the sampling chamber is somewhat accomplished by the two-way flushing action which occurs during each filling and pressuring cycle.

6. Collects spot samples at either preset time intervals or paced by an external flowmeter and composites them in a suitable container.

7. Appears unsuitable for collection of either floatable materials or coarser bottom solids.

8. Portable top-opening, absorption-type refrigerator available as an option to maintain sample compartment at desired temperature. Some cross-contamination appears likely.

9. Portable unit can be used for manhole operation.

10. Case is weatherproof but will not withstand total immersion.

11. Can operate in freezing ambients if fitted with optional winterizing kit.

12. Upper lift limit of 16.8m (55 ft) poses little restriction on operating head conditions.

Designation:	PROTECH MODEL CEL-300
Manufacturer:	Protech, Inc. Roberts Lane Malvern, Pennsylvania 19355 Phone (215) 644-3854
Sampler Intake:	Plastic cylindrical (about 10 cm diameter x 20 cm long) screen perforated with over 500-0.5 cm (3/16 in.) diameter ports over pump inlet.
Gathering Method:	Forced flow from submersible pump.
Sample Lift:	Standard maximum is 9.1m (30 ft.)
Line Size:	1.3 cm (1/2 in.) I.D. inlet hose.
Sample Flow Rate:	3.8 to 7.6 ℓpm (1 to 2 gpm) recommended.
Sample Capacity:	Aliquot volume (2 to 65 mℓ) is a function of the preset diversion time; 5.8ℓ (1.5 gal) composite container is standard.
Controls:	Unit operates on continuous-flow principle, returning the uncollected sample to waste. Sample is pumped through a non-clogging flow-diverter type chamber. Upon receiving a signal from either an external flow registering device or the built-in timer, the unit diverts the flow for a preset period of time (adjustable from 0.06 to 1.0 second) to the sample container. When operating in the timed sampling mode, the sampling frequency can be set for 1, 2, or 5 minutes. When operating in the flow-proportional mode the sampler may accept either a timed pulse signal which can be accumulated (totalized) by the built-in timer, or a single totalized signal whereupon the sampler will be fired directly.

Power Source:	115 VAC.
Sample Refrigerator:	Available as an option in portable model. Stationary models have automatic refrigerated sample compartment.
Construction Materials:	Sampling train; PVC, nylon, stainless steel, and TFE resins; case is aluminum with baked vinyl finish.
Basic Dimensions:	Portable - 33 x 48 x 43 cm (13 x 19 x 17 in.), weighs 31.8 kg (70 lbs) total; Stationary indoor - 69 x 66 x 127 cm (27 x 26 x 50 in.), weighs 113 kg (250 lbs) total; Stationary outdoor - 76 x 66 x 152 cm (30 x 26 x 60 in.), weighs 125 kg (275 lbs) total.
Base Price:	$1,495 portable, $2,205 stationary indoor, $2,750 stationary outdoor; all include 11m (36 ft) of 1.3 cm (1/2 in.) I.D. inlet hose, 6.1m (20 ft) of 2.5 cm (1 in.) waste return hose, clamps, submersible magnetic-drive pump, motor, and sample container. Alternative pumps are direct-drive submersible (add $10), flexible-impeller positive-displacement (add $25), progressive-cavity positive-displacement (add $185), open-impeller centrifugal (add $145), and closed-impeller centrifugal (add $175).
General Comments:	Model DEL-400S is essentially similar except that it takes up to 24 discrete samples in separate 500 mℓ containers. It is housed in a stationary outdoor cabinet measuring 76 x 81 x 183 cm (30 x 32 x 72 in.) and total weight is 154 kg (340 lbs). Aluminum cabinet version weighs 93 kg (205 lbs). Standard model costs $3,995 and aluminum version is $4,765.

Protech Model CEL-300 Evaluation

1. Large sampling screen chamber over pump inlet can tolerate blockage of a number of ports and still function. Pump and tubing should be free from clogging.

2. Submersible pump and screen present an obstruction to the flow.

3. Should be capable of operation over the full range of flow conditions.

4. Movement of small solids should not affect operation; large objects could damage (or even physically destroy) the in-water portion unless special protection is provided by user.

5. No automatic starter since designed for continuous flow. Continuous flow serves a self cleaning function of all except line from diverter to sample bottle.

6. Collects spot samples paced either by built-in timer or external flowmeter and composites them in a suitable container. DEL-400 collects 24 discrete samples.

7. Appears unsuitable for collection of either floatable materials or coarser bottom solids.

8. Absorption type refrigerator available as an option in portable version. Stationary units have automatic refrigerated sample compartment. Cross-contamination should not be too great.

9. Portable unit is designed for manhole operation.

10. Cannot withstand total immersion.

11. Can operate in freezing ambients unless fitted with optional winterizing kit.

12. Upper lift limit of 9.1m (30 ft) does not pose a great restriction on operating head conditions.

Designation:	QCEC MODEL CVE
Manufacturer:	Quality Control Equipment Company P.O. Box 2706 Des Moines, Iowa 50315 Phone (515) 285-3091
Sampler Intake:	End of suction line installed to suit by user.
Gathering Method:	Suction lift from vacuum pump.
Sample Lift:	6m (20 ft.) maximum.
Line Size:	0.64 cm (1/4 in.) I.D.
Sample Flow Rate:	Depends upon lift, but under 3 ℓpm (0.8 gpm).
Sample Capacity:	Adjustable aliquots of from 20 to 50 mℓ are composited in a 1.9ℓ (1/2 gal) jug (standard) or 3.8ℓ (1 gal) jug (optional).
Controls:	Sampling cycles can either be started at fixed, selected intervals by a built-in timer or in response to signals from an external flowmeter.
Power Source:	115 VAC standard; 12 VDC optional.
Sample Refrigerator:	Standard model has insulated case with built-in ice chamber; automatic refrigeration is available as an option.
Construction Materials:	Sampling train is tygon, polypropylene, polyethylene, and glass; case is fiberglass.
Basic Dimensions:	38 x 38 x 61 cm (15 x 15 x 24 in.) portable.
Base Price:	$570 for base unit with timer only. Add $175 for control to allow pacing by external flowmeter, $250 for mechanical refrigeration, $35 for electric heater.

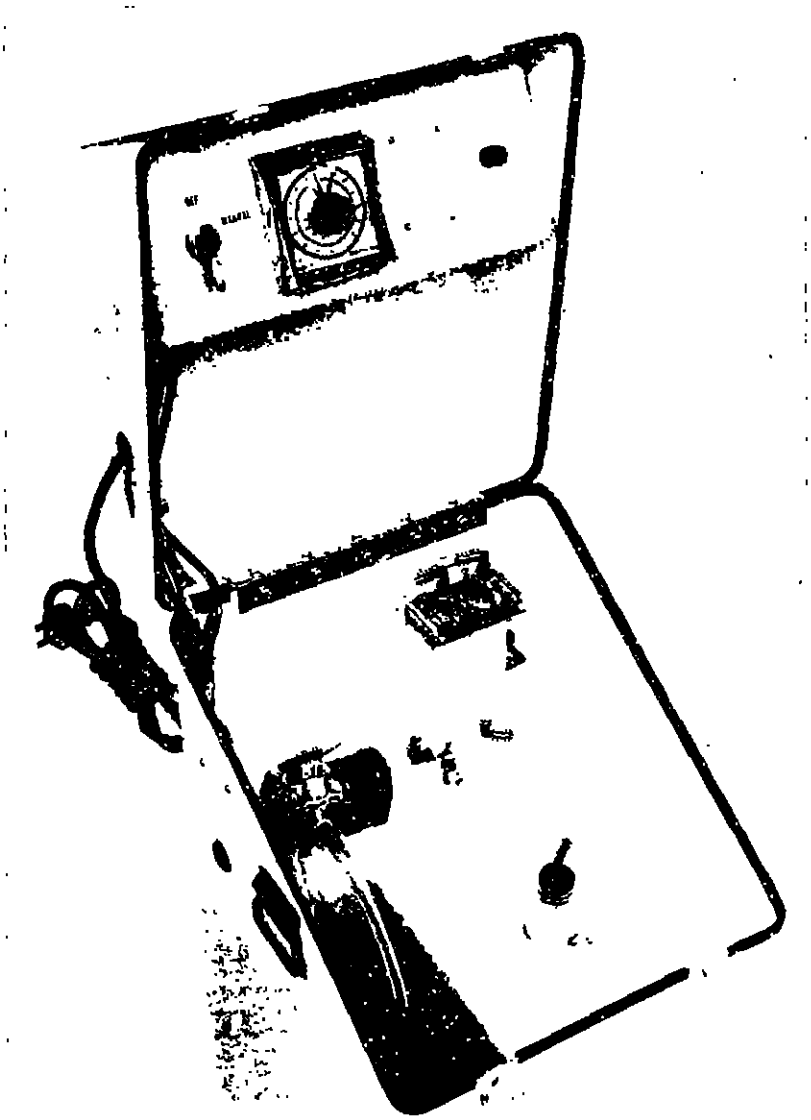

Figure 12. Quality Control Equipment Company
Model CVE Sampler

Photograph courtesy of Quality Control Equipment Company

General Comments: Unit was developed by Dow Chemical and is manufactured under license. It uses a patented vacuum system which delivers a volumetrically controlled sample on signal. Liquid is lifted through suction tube into a sample chamber (which is connected to the sample container) with a float check valve. When the chamber is filled to the desired level it is automatically closed to vacuum, the pump shuts off, and the sample is forcibly drawn into the sample container. The suction line drains by gravity to the source. An option provides an 5.6 kg/sq cm (80 psi) blow-down of the sampling train just prior to sampling assuring that no old material remains in the submerged lower end of the suction tube, helps clean the lines of any accumulations which might clog or plug, and provides a fresh air purge of the entire system.

QCEC Model CVE Evaluation

1. Should be relatively free from clogging due to lack of bends and fittings in sample train and optional 5.6 kg/sq cm (80 psi) purging feature.

2. Obstruction of flow will depend upon way user mounts end of sampling tube.

3. Should operate fairly well over the entire range of flow conditions.

4. Movement of solids should not hamper operation.

5. No automatic starter. Optional purge serves a self-cleaning function.

6. Can collect samples paced by either built-in timer or external flowmeter and composite them in a suitable container. Representativeness of sample will depend upon user mounting of intake tube.

7. Unit does not appear suitable for collection of floatables or coarser bottom solids.

8. Standard unit has insulated sample container with ice chamber; automatic refrigeration is optional. Appears to offer good sample protection and freedom from precontamination.

9. Unit would appear to function satisfactorily in a manhole environment.

10. Cannot withstand total immersion.

11. Thermostatically controlled heater is available for applications in freezing ambients.

12. Maximum lift of 6m (20 ft) does not place too severe a restriction on use of the unit.

Designation:	QCEC MODEL CVE II
Manufacturer:	Quality Control Equipment Company P.O. Box 2706 Des Moines, Iowa 50315 Phone (515) 285-3091
Sampler Intake:	End of suction line installed to suit by user.
Gathering Method:	Suction lift from vacuum pump.
Sample Lift:	6m (20 ft) maximum.
Line Size:	0.64 cm (1/4 in.) I.D.
Sample Flow Rate:	Adjustable up to 3 ℓpm (0.8 gpm).
Sample Capacity:	Adjustable aliquots of from 20 to 50 mℓ are composited in a 3.8ℓ (1 gal) jug.
Controls:	New all solid state control system with interval timing module will accept signals from external flowmeters and perform its own integration to provide flow proportional sampling. It will also accept external time pulse signals, or signals from sampling switches, or operate on a straight timed interval basis. Sample flow rate is also adjustable.
Power Source:	115 VAC standard; 12 VDC optional, including internal gel-cell battery.
Sample Refrigerator:	Standard model has insulated case with built-in ice chamber; automatic refrigeration is available as an option.
Construction Materials:	Sampling train is tygon, polypropylene, polyethylene, and glass; case is fiberglass.

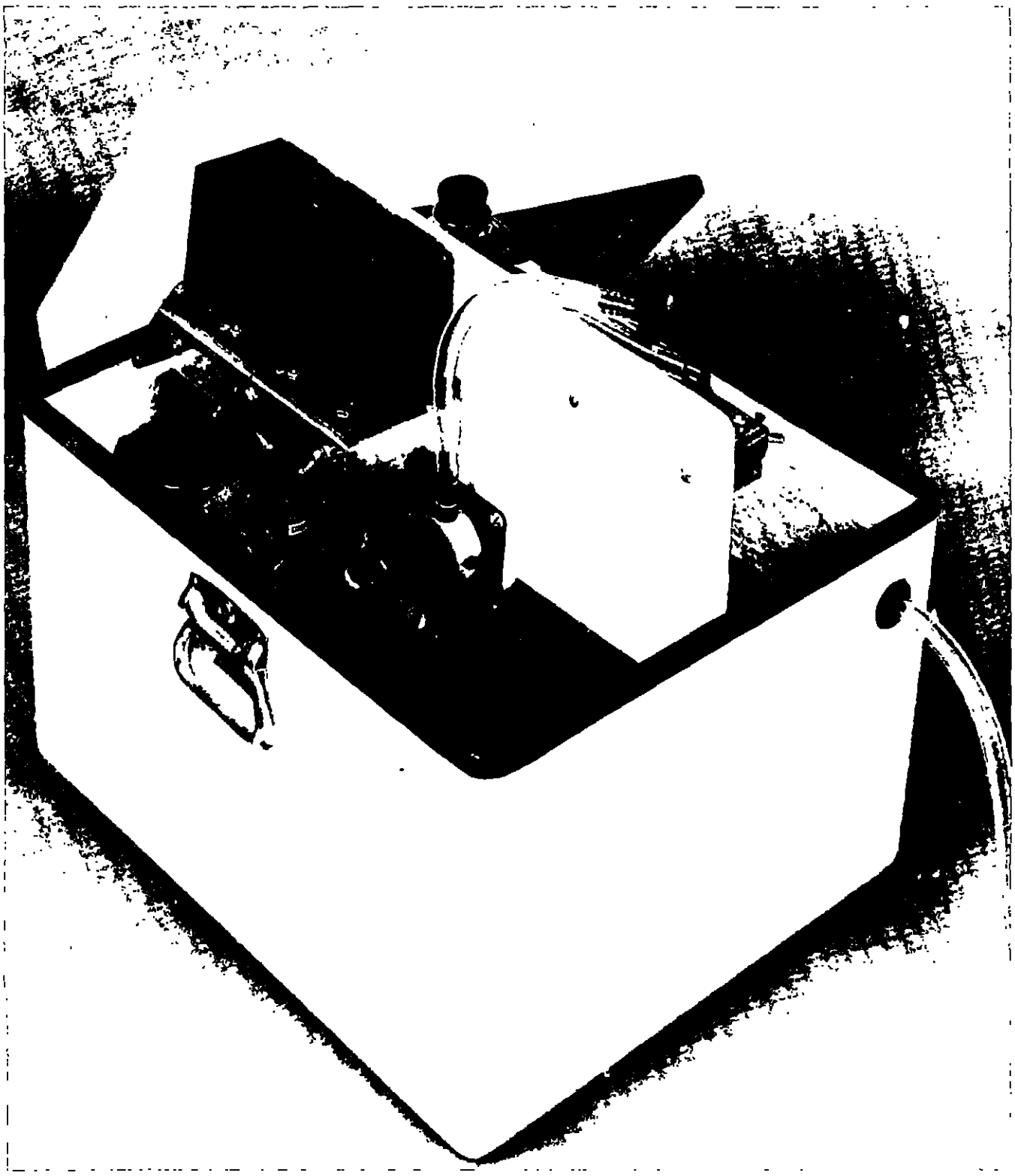

Figure 13. Quality Control Equipment Company
Model CVE II Sampler

Photograph courtesy of Quality Control Equipment Company

Basic Dimensions:	About 43 x 38 x 51 cm (17x15x20 in.); portable.
Base Price:	Approximately $1,000 for basic unit.
General Comments:	This unit is essentially an improved version of the older CVE. Its internal battery will last up to 4 days on a single charge. Up to two weeks operation is possible with automotive type batteries. Unit has built-in charger. The new solid state control system allows the double blow-down feature to operate in all control modes. Sample intake velocity is now adjustable. In both the standard case and a specially designed housing for suspension in manholes, the sample container and battery are easily removable from the top.

QCEC Model CVE II Evaluation

1. Should be relatively free from clogging due to lack of bends and fittings in sample train and optional 5.6 kg/sq cm (80 psi) purging feature.

2. Obstruction of flow will depend upon way user mounts end of sampling tube.

3. Should operate fairly well over the entire range of flow conditions; sample intake velocity is adjustable.

4. Movement of solids should not hamper operation.

5. May be triggered by external signal. Optional purge serves a self-cleaning function.

6. Can collect samples paced by either built-in timer or external flowmeter and composite them in a suitable container. Representativeness of sample will depend upon user mounting of intake tube.

7. Unit does not appear suitable for collection of floatables or coarser bottom solids.

8. Standard unit has insulated sample container with ice chamber; automatic refrigeration is optional. Appears to offer good sample protection and freedom from precontamination.

9. Unit would appear to function satisfactorily in a manhole environment.

10. Cannot withstand total immersion.

11. Thermostatically controlled heater is available for applications in freezing environments.

12. Maximum lift of 6m (20 ft) does not place too severe a restriction on use of the unit.

Designation:	QCEC MODEL E
Manufacturer:	Quality Control Equipment Company P.O. Box 2706 Des Moines, Iowa 50315 Phone (515) 285-3091
Sampler Intake:	Dipping bucket.
Gathering Method:	Mechanical; dipper on sprocket-chain drive.
Sample Lift:	To suit; manufacturer claims no reasonable limit to working depth.
Line Size:	Not applicable.
Sample Flow Rate:	Not applicable.
Sample Capacity:	Dipping bucket holds 60 mℓ; user supplies sample composite container to suit.
Controls:	Sampling cycles can either be started at fixed, selected intervals by a built-in timer or in response to signals from an external flowmeter.
Power Source:	115 VAC Electricity
Sample Refrigerator:	None
Construction Materials:	Dipper is stainless steel; sprockets and chain are corrosion-resistant cast iron (stainless available), supports are provided by user.
Basic Dimensions:	Upper unit is 20 x 39 x 36 cm (8 x 15.5 x 14 in.); lower unit is 7.6 x 11.4 cm (3 x 4.5 in.).
Base Price:	$965 plus $25 per foot beyond 6'; add $400 for stainless steel sprockets and chain plus $45 per foot beyond 6', $175 for control to allow pacing by external flowmeter.

General Comments: Manufacturer states that unit was designed as a permanently installed sampler for the most difficult applications such as packing houses, steel mills, pulp mills, and municipal applications. Unit must be custom installed by user. Minimum water depth required is 10 cm (4 in.).

QCEC Model E Evaluation

1. Clogging of sampling train is unlikely; however, the exposed chain-sprocket drive is vulnerable to jamming by rags, debris, etc.

2. Unit provides a rigid obstruction to flow.

3. Unit should operate over full range of flows.

4. Movement of solids could jam or physically damage unit.

5. No automatic starter; no self cleaning features.

6. Collects fixed size aliquots paced by built-in timer or external flowmeter and composites them in a suitable container.

7. Does not appear well suited for collecting either floatables or coarser bottom solids.

8. No sample collector provided.

9. Unit is capable of manhole operation.

10. Unit is weatherproof; cannot withstand total immersion.

11. Unit is not suitable for prolonged operation in freezing ambients.

12. Unit would appear impractical for very long lifts, say above 18m (60 ft).

Designation:	RICE BARTON EFFLUENT SAMPLER
Manufacturer:	Rice Barton Corporation P.O. Box 1086 Worcester, Massachusetts 01601 Phone (617) 752-2821
Sampler Intake:	Open end of rigid pipe extending from below expected low water level to above sample container.
Gathering Method:	Suction lift from vacuum pump.
Sample Lift:	Around 3.7m (12 ft) maximum.
Line Size:	Smallest line appears to be about 2.5 cm (1 in.)
Sample Flow Rate:	Will vary with lift.
Sample Capacity:	Adjustable size aliquots of from 200 to 500 mℓ are composited in a user-supplied container.
Controls:	Panel offers selection of manual, timed sequence, or automatic remote modes. Timing cycles can be varied from one to ten minutes, or longer if necessary.
Power Source:	110 VAC.
Sample Refrigerator:	None.
Construction Materials:	Sampling train has all non-corrosive effluent contact surfaces.
Basic Dimensions:	Draw pipe, sample discharge tube and valve unit are sample lift plus about 0.9m (3 ft) long; motor, pump, and control unit appear to be about 0.6 x 0.1 x 0.9m (2x1x3 ft); appears best suited for fixed installations.
Base Price:	Not available at time of writing.

General Comments: Large diameter sample draw pipe is normally pressurized with zero effluent level. On signal, an air control valve is shifted to vacuum and the effluent rises in the draw pipe until the sample discharge pipe is full. A liquid probe contact signal shifts the air control valve to pressure, leaving sample discharge pipe full. Timer signal opens sample discharge valve and sample is discharged to container. Valve closes and unit is ready for next cycle. Unit was designed for sampling of effluents with high solids content.

Rice Barton Effluent Sampler Evaluation

1. Only the sample discharge valve offers any vulnerability to clogging.

2. Draw pipe offers a rigid obstruction to flow.

3. Should operate reasonably well over all flow conditions. Representativeness may be questionable at high flow rates.

4. Movement of small solids should not hamper operation; large objects could damage (or even physically destroy) the intake pipe.

5. Accepts remote triggering; no self-cleaning features.

6. Unit essentially collects aliquots at fixed time periods and composites them in a user-supplied container.

7. Appears unsuitable for collection of either floatables or coarser bottom solids.

8. No refrigeration. Sample protection must be provided by user. Cross-contamination appears likely.

9. Unit is not designed for manhole operation.

10. Cannot withstand total immersion.

11. Should be able to operate in freezing ambients for some period of time.

12. Maximum lift of 3.7m (12 ft) puts some restriction on use of unit.

Designation:	SERCO MODEL NW-3
Manufacturer:	Sonford Products Corporation 100 East Broadway, Box B St. Paul Park, Minn. 55071 Phone (612) 459-6065
Sampler Intake:	24-0.64 cm (1/4 in.) I.D. vinyl sampling lines are connected to individual ports in a stainless steel sampling head (approx 10 cm dia) and protected by a stainless steel shroud.
Gathering Method:	Suction lift from vacuum in evacuated sample bottles.
Sample Lift:	0.9m (3 ft) standard; sample size reduced as lift increases; about 3m (10 ft) appears practical upper limit.
Line Size:	0.64 cm (1/4 in.) inside diameter.
Sample Flow Rate:	Varies with filling time, atmospheric pressure, bottle vacuum, sample lift, etc.
Sample Capacity:	24-473 mℓ French square glass bottles are provided. Sample sizes up to 400 mℓ can be obtained depending upon lift, bottle vacuum and atmospheric pressure; 200 mℓ is typical.
Controls:	A spring driven clock via a changeable gearhead rotates an arm which trips line switches at a predetermined time interval triggering sample collection. Sampling intervals of 2, 3, or 8 hours and 5, 10 or 30 minutes are available in addition to the standard one hour interval.
Power Source:	Spring driven clock.
Sample Refrigerator:	Has ice cavity for cooling:

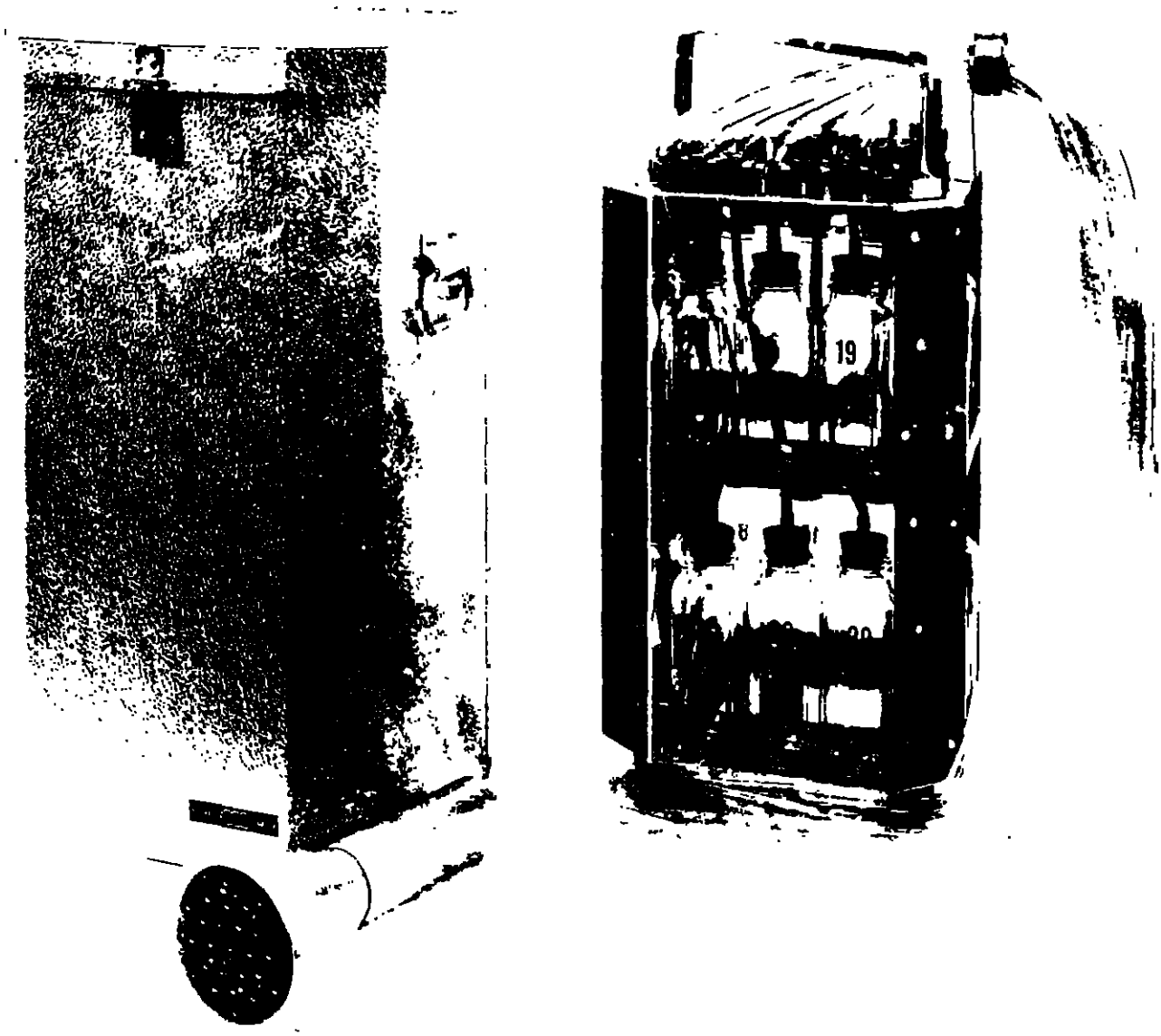

Figure 14. SERCO Model NW-3 Sampler

Photograph courtesy of Sonford Products Corp.

Construction Materials:	Aluminum case with rigid polystyrene insulation; aluminum bottle rack; glass bottles with rubber stoppers and rubber lines through switch plate, plastic connectors and vinyl lines to stainless steel sampling head.
Basic Dimensions:	39 x 39 x 68 cm (15.5 x 15.5 x 26.8 in.) empty weight is 25 kg (55 lbs; portable.
Base Price:	$920 including vacuum pump.

Serco Model NW-3 Evaluation

1. Sampling head is vulnerable to blockage of a number of sampling ports at one time by paper, rags, plastic, etc. Sampling train is an unobstructed 0.64 cm (1/4 in.) passageway which will pass small solids. No pump to clog.

2. Sampling head and shroud are simply dangled in the flow stream to be sampled. No rigid obstruction.

3. Low sampling velocities make representativeness of samples questionable at high flow rates. Length of protective shroud limits immersion to about 0.3m (1 ft) before vinyl sampling tubes are exposed to flow.

4. Sampling head would appear to be vulnerable to clogging if in bed load. Stainless steel shroud offers good protection against movement of solids in flow stream.

5. Optional automatic starter available which allows remote starting by either clock or float mechanism. Otherwise must be started manually. No self cleaning features. Proper cleaning of all 24 sampling lines would be difficult and time consuming in the field.

6. Collects discrete samples at preset times.

7. Appears unsuitable for collection of samples of either floatable materials or coarser bottom solids.

8. Provision for ice cooling affords some sample protection for a limited time. Limited lift may require

placing sampler case in a vulnerable location. Use of individual sampling lines eliminates cross contamination possibility.

9. Unit will pass through a 51 cm (20 in.) diameter circle. Case has base opening where sampling line bridle emerges. Should be capable of manhole operation.

10. Case will fill with fluid if submerged. Spring clock and drive mechanism then becomes vulnerable, especially if fluid contains solids.

11. No standard provision for heating case. Freezing of sampling lines appears a distinct possibility.

12. Practical upper lift limit of 3m (10 ft) poses restrictions on operating head conditions.

Designation:	SERCO MODEL TC-2
Manufacturer:	Sonford Products Corporation 100 East Broadway, Box B St. Paul Park, Minn. 55071 Phone (612) 459-6065
Sampler Intake:	Provided by user; sampler has standard 5 cm (2 in.) pipe inlet.
Gathering Method:	External head to provide flow through a sample reservoir from which a mechanical arm actuated by an air cylinder with a dipper cup extracts a sample aliquot and transfers it to a funnel where it is gravity fed to a composite bottle.
Sample Lift:	Not applicable.
Line Size:	Smallest line in sampling train is the one connecting the funnel to the tube leading to the sample bottle; it appears to be about 2 cm (3/4 in.).
Sample Flow Rate:	Recommended flow rate through sampler is 38 to 47 ℓpm (10 to 15 gpm). Reservoir is designed so that sufficient velocity and turbulence will prevent settling or separation.
Sample Capacity:	Sampling dippers are available in either 10 or 20 mℓ capacity; a two gallon sample composite container is provided.
Controls:	Takes samples either on signal from a preset timer or from signals originating from an external flowmeter.
Power Source:	115 VAC electrical plus low pressure plant air.
Sample Refrigerator:	Automatic refrigeration unit thermostatically controlled to maintain sample temperature at 4° to 10°C.

Construction Materials:	Sampling arm is all brass and stainless steel; dipper cup is plastic; cabinet is stainless steel with zinc plated framing and porcelain interior.
Basic Dimensions:	97 x 61 x 88 cm (38 x 24 x 35 in.) plus sampling arm which extends up 60 cm (23.5 in.) and back about 0.3m (1 ft). Designed for fixed installation.
Base Price:	$2,495
General Comments:	A permanent installation for continuous composite sampling. The actual sampling device is simply an open cup which is large enough to permit sampling all sizes of suspended solids normally encountered in wastewater flows. Because the cup is emptied by turning it over completely, the entire sample is removed and there is little likelihood of solids being retained in the cup.

Serco Model TC-2 Evaluation

1. Should be free from clogging. Sampling intake must be designed by user.

2. Sampler itself offers no flow obstruction.

3. Should operate well over entire range of flow conditions.

4. Movement of solids should not hamper operation.

5. Designed for continuous operation; no automatic starter. Continuous flow serves a self cleaning function and should minimize cross-contamination.

6. Can collect either flow proportional composite or fixed time interval composite. Representativeness of sample will be a function of sampling intake which is not a part of this unit.

7. Collection of floatables and coarser bottom solids will depend upon design of sampling intake.

8. Automatic refrigeration maintains samples at 4° to 10°C. Offers good sample protection and freedom from precontamination.

9. Not designed for confined space or manhole operation.

10. Cannot withstand total immersion.

11. Not designed for use in freezing ambient conditions.

12. Operating head is provided by user.

Designation:	SIGMAMOTOR MODEL WA-1
Manufacuter:	Sigmamotor, Inc. 14 Elizabeth Street Middleport, New York 14105 Phone (716) 735-3616
Sampler Intake:	End of 7.6m (25 ft) long suction tube installed to suit by user.
Gathering Method:	Suction lift from nutating-type peristaltic pump.
Sample Lift:	6.7m (22 ft) maximum lift.
Line Size:	0.3 cm (1/8 in.) I.D.
Sample Flow Rate:	60 mℓ per minute.
Sample Capacity:	Adjustable size aliquots of from 60 to 1,800 mℓ are composited in a 5.8ℓ (2.5 gal) sample container.
Controls:	Built-in timer triggers unit once every 30 minutes. Model WA-2 has an adjustable timer allowing sampling interval to be set from 1 to 30 minutes.
Power Source:	115 VAC. Model WD-1 comes with a N. Cad battery pack and charger.
Sample Refrigerator:	None. Model WA-2R has an automatic refrigeration unit for cooling sample compartment.
Construction Materials:	Sample train is tygon and polyethylene; case is ABS plastic.
Basic Dimensions:	WA-1, WA-2, WD-1, WD-2 - 34 x 25 x 36 cm (13.5 x 10 x 14 in.) WA-2R - 53 x 53 x 86 cm (21 x 21 x 34 in.); weights are WA-1 8.2 kg (18 lbs) WA-2 8.6 kg (19 lbs), WD-1 12.7 kg (28 lbs), WD-2 13.2 kg (29 lbs), WA-2R 40.8 kg (90 lbs); all portable.
Base Price:	$430 WA-1; $600 WD-1 $480 WA-2; $650 WD-2; $730 WA-2R

General Comments: Charge time for battery operated models is 16 hours. On model WA-2R the pump automatically purges the tubing at the end of each sampling cycle to help prevent bacterial growth in the line.

Sigmamotor Model WA-1 Evaluation

1. Obstruction or clogging will depend upon user installation of intake line; the peristaltic pump can tolerate solids but the 0.3 cm (1/8 in.) I.D. tubing size is rather small.

2. Obstruction of flow will depend upon user mounting of intake line.

3. Should operate reasonably well under all flow conditions, but fairly low intake velocity could affect representativeness of sample at high flow rates.

4. Movement of solids within the fluid flow should not affect operation adversely.

5. No automatic starter. Only the refrigerated model has an automatic purging feature for self-cleaning.

6. Unit takes fixed time interval samples paced by a built-in timer and composits them in a suitable container.

7. Unit does not appear suitable for collecting either floatables or coarser bottom solids.

8. Units offer reasonable sample protection; a refrigerated model is available to maintain sample at a preset temperature.

9. Unit appears capable of manhole operation.

10. Unit cannot withstand total immersion.

11. Unit cannot withstand freezing ambients.

12. Maximum lift of 6.7m (22 ft) does not place a great operating restriction on unit. All but the refrigerated model will pass through a standard manhole.

Designation:	SIGMAMOTOR MODEL WAP-2
Manufacturer:	Sigmamotor, Inc. 14 Elizabeth Street Middleport, New York 14105 Phone (716) 735-3616
Sampler Intake:	End of 7.6m (25 ft) long suction tube installed to suit by user.
Gathering Method:	Suction lift from nutating-type peristaltic pump.
Sample Lift:	6.7m (22 ft) maximum lift
Line Size:	0.3 cm (1/8 in.) I.D.
Sample Flow Rate:	60 mℓ per minute
Sample Capacity:	Unit takes a 5.8ℓ (2.5 gal) composite sample.
Controls:	Models WAP-2, WAP-2R and WDP-2 vary the number of samples in response to a varying signal from a user-supplied flow transmitter. The unit will deliver a 30 second sample (nominally 30 mℓ) every 4 minutes at a maximum signal strength, every 8 minutes at one-half signal strength, etc. Models WAPP-2, WAPP-2R and WAPP-2 respond to a switch closure from an external flow meter and take an adjustable size aliquot variable from 36 to 640 cc per switch closure.
Power Source:	Models WAP-2, WAP-2R, WAPP-2R and WDPP-2 operate on 115 VAC. Models WDPP-2 and WDP-2 operate on 115 VAC or 12 VDC and are supplied with a NiCad battery pack and charger.
Sample Refrigerator:	None. Models WAP-2R and WAPP-2R have an automatic refrigeration unit for cooling sample compartment.

Construction Materials:	Sample train is tygon and polyethylene. Case is ABS plastic.
Basic Dimensions:	Models WAP-2, WAPP-2, WDP-2 and WDPP-2 are 34 x 30 x 37 cm (13.5x10x14.5 in.); Models WAP-2R and WAPP-2R are 53 x 56 x 86 cm (21x22x34 in.); weights are WAP-2 and WAPP-2 8.6 kg (19 lbs), WAP-2R and WAPP-2R 44.5 kg (98 lbs), WDP-2 and WDPP-2 13.2 kg (29 lbs); portable.
Base Price:	WAP-2 $650 WAP-2R $870 WAPP-2 $500 WAPP-2R $800 WDP-2 $820 WDPP-2 $700
General Comments:	All models come with 1.8m (6 ft) of 3-wire cord; charge time for battery operated models is 16 hours. A winterizing kit is available at $95 to allow effective operation at temperatures to -23°C (-10°F). A stainless steel strainer anchor intake is available, at $15, to prevent plugging of sampling tubes.

Sigmamotor Model WAP-2 Evaluation

1. Obstruction or clogging will depend upon user installation of intake line and use of the optional strainer intake. The peristaltic pump can tolerate solids but the tubing size is rather small.

2. Obstruction of flow will depend upon user mounting of intake lines and/or use of optional strainer intake.

3. Should operate reasonably well under all flow conditions, but fairly low intake velocity could affect representativeness of sample at high flow rates.

4. Movement of solids within the fluid flow should not affect operation adversely.

5. No automatic starter. No self-cleaning features. Small amount of cross-contamination is possible.

6. Unit takes composite samples paced by external flow-meter.

7. Unit does not appear suitable for collecting either floatables or coarser bottom solids.

8. Unit offers reasonable sample protection from damage and deterioration. Models WAP-2R and WAPP-2R have refrigerated units to store samples.

9. All but refrigerated units appear capable of manhole operation.

10. Unit cannot withstand total immersion.

11. Unit cannot withstand freezing ambients unless winterized.

12. Lift of 6.7m (22 ft) does not place a severe operating restriction on unit. All but the refrigerated models will pass through a standard manhole.

Designation:	SIGMAMOTOR MODEL WM-3-24
Manufacturer:	Sigmamotor, Inc. 14 Elizabeth Street Middleport, New York 14105 Phone (716) 735-3616
Sampler Intake:	End of 7.6m (25 ft) long suction tube installed to suit by user.
Gathering Method:	Suction lift from nutating-type peristaltic pump.
Sample Lift:	6.7m (22 ft) maximum lift.
Line Size:	0.3 cm (1/8 in.) I.D.
Sample Flow Rate:	60 mℓ per minute
Sample Capacity:	Unit takes 24 discrete 450 mℓ samples.
Controls:	Sampling frequency adjustable from one every ten minutes to one every hour.
Power Source:	115 VAC for models WM-2-24, WM-3-24 and WM-1-24R; 12 VDC or 115 VAC for Model WM-4-24, which comes with a wet-type lead-acid battery (35 amp hours capacity) and charger; 12 VDC or 115 VAC for Model WM-2-24 which comes with a NiCad battery pack and charger.
Sample Refrigerator:	None. Model WM-1-24R has an automatic refrigerated case for entire sampler and collection unit.
Construction Materials:	Sample train is tygon and polyethylene; tygon and glass for Model WM-2-24.
Basic Dimensions:	WM-3-24 and WM-4-24 are 61 x 37 x 64 cm (20x14.5x25 in.); WM-2-24 is 37 x 34 x 62 cm (14.5x13.5x24.5 in.); and WM-1-24R is 53 x 56 x 86 cm (21x22x34 in.).

Weights are WM-2-24 and WM-3-24, 16.3 kg (36 lbs); WM-4-24, 25.4 kg (56 lbs); and WM-1-24R, 56.7 kg (125 lbs). Portable.

Base Price:

WM-3-24	$975	WM-4-74	$1,075
WM-2-24	$1,200	WM-1-24R	$1,525

General Comments:

Ten meters (10 ft) of 3-wire retractable power cord is supplied with WM-3-24 and WM-4-24; 1.8m (6 ft) of 3-wire power cord is supplied with WM-1-24R. At the end of each sampling cycle, the pump automatically reverses, purging the sample line and tending to make each sample completely discrete. On Models WM-3-24 and WM-4-24, the sample line feeds into a funnel attached to a rotating nozzle which is automatically positioned to fill the next sample container. A one-piece deep-drawn plastic distribution plate is used to route the sample from the nozzle to the containers, which are in a rectangular array. On Models WM-1-24R and WM-2-24, an indexing arm positions the pump discharge tubing sequentially over each filling nozzle, each of which is connected by a separate piece of tubing to its individual sample container. Model WM-4-24 is supplied with a 6 amp automatic battery charger which adjusts charging rate to battery condition. This may be left connected for trickle charge. Charge time is 3-1/2 to 4-1/2 hours. Charge time for the NiCad battery pack of Model WM-2-24 is 16 hours. A winterizing kit for Models WM-3-24 and WM-4-24 is available, at $95, for effective operation to temperatures of -23°C (-10°F).

A strainer-anchor is available for $15. to prevent plugging of sampling tubes.

Sigmamotor Model WM-3-24 Evaluation

1. Obstruction or clogging will depend upon user installation of intake line and use of the optional strainer intake. The peristaltic pump can tolerate solids but the tubing size is rather small.

2. Obstruction of flow will depend upon user mounting of intake line.

3. Should operate reasonably well under all flow conditions but fairly low intake velocity could affect representativeness of sample at high flow rates.

4. Movement of solids within the fluid flow should not affect operation adversely.

5. No automatic starter. At the end of each cycle the pump automatically reverses, purging the sample line to help prevent cross-contamination.

6. Unit takes 24 discrete samples at preset time intervals paced by a built-in timer and deposits them in individual containers.

7. Unit does not appear suitable for collecting either floatables or coarser bottom solids.

8. Unit offers reasonable sample protection; Model WM-1-24R has a refrigerator unit to maintain samples at a preset temperature.

9. Models WM-2-24, WM-3-24 and WM-4-24 appear capable of manhole operation, but Model WM-1-24R does not.

10. Unit cannot withstand total immersion.

11. Unit cannot withstand freezing ambients unless winterized.

12. Maximum lift of 6.7m (22 ft) does not place a great operating restriction on units. All but the refrigerated model will pass through a standard manhole.

Designation:	SIGMAMOTOR MODEL WA-5
Manufacturer:	Sigmamotor, Inc. 14 Elizabeth Street Middleport, New York 14105 Phone (716) 735-3616
Sampler Intake:	End of 7.6m (25 ft) long suction tube installed to suit by user.
Gathering Method:	Suction lift from finger-type peristaltic pump.
Sample Lift:	5.5m (18 ft) maximum lift with 0.64 cm (1/4 in.) tubing; 3m (10 ft) with 0.95 cm (318 in.) tubing; 1.5m (5 ft) with 1.3 cm (1/2 in.) tubing.
Line Size:	0.64 cm (1/4 in.) I.D. standard. Also available in 0.5 cm (3/16 in.), 0.95 cm (3/8 in.), or 1.3 cm (1/2 in.) I.D.
Sample Flow Rate:	80 mℓ per minute.
Sample Capacity:	Adjustable size aliquots are composited in a 19ℓ (5 gal) sample container. Aliquots for Model WA-5 are from 80 mℓ to 2400 mℓ; Model WD-5 from 80 mℓ to 4800 mℓ and Model WA-5R from 60 to 1800 mℓ.
Controls:	Adjustable timer for Models WA-5 and WA-5R allows sampling interval to be set from one to thirty minutes, and for Model WD-5 from one to 60 minutes.
Power Source:	115 VAC for Models WA-5 and WA-5R; 115 VAC or 12 VDC for Model WD-5. WD-5 comes with a wet type lead-acid battery (35 amp-hours capacity) and charger.

Sample Refrigerator:	None. Model WA-5R has an automatic refrigeration unit for cooling sample compartment.
Construction Materials:	Sample train is tygon, and polyethylene; case is fiberglass.
Basic Dimensions:	Models WA-5 and WD-5 are 51 x 37 x 64 cm (20x14.5x25 in.); Model WA-5R is 53 x 56 x 150 cm (21x22x59 in.); weights are WA-5 18.1 kg (40 lbs), WD-5 27.2 kg (60 lbs), WA-5R 56.7 kg (125 lbs); all portable.
Base Price:	$750 WA-5 $900 WD-5 $990 WA-5R
General Comments:	Unit comes with 3m (10 ft) of 3-wire retractable power cord; Model WA-5R comes with 1.8m (6 ft) of 3-wire power cord. A 6-amp automatic battery charger is included with Model WD-5. Unit adjusts charging rate to battery condition. Charge time is 3-1/2 to 4-1/2 hours and may be connected for trickle charge. A winterizing kit is available for Models WA-5 and WD-5, at $95, for effective operation to temperatures of -23°C (-10°F). A stainless steel strainer-anchor intake is available for $15 to prevent plugging of sampling tubes.

Sigmamotor Model WA-5 Evaluation

1. Obstruction or clogging will depend upon user installation of intake line and use of the optional strainer intake. The unobstructed sampling line and the peristaltic pump should tolerate solids fairly well.

2. Obstruction of flow will depend upon user mounting of intake line and/or use of optional strainer intake.

3. Should operate reasonably well under all flow conditions, but fairly low intake velocity could affect representativeness of sample at high flow rates.

4. Movement of solids within the fluid flow should not affect operation adversely.

5. No automatic starter; no self-cleaning feature.

6. Unit takes simple composite samples paced by a built-in timer.

7. Unit does not appear suitable for collecting either floatable or coarser bottom solids.

8. Unit offers reasonable sample protection from damage and deterioration. Model WA-5R has a refrigeration unit to store sample.

9. Models WA-5 and WD-5 appear capable of manhole operation; Model WA-5R does not.

10. Unit cannot withstand total immersion.

11. Unit cannot withstand freezing ambients unless winterized.

12. Lift capacity will depend upon tubing size. All but the refrigerated model will pass through a standard manhole.

Designation:	SIGMAMOTOR MODEL WAP-5
Manufacturer:	Sigmamotor, Inc. 14 Elizabeth Street Middleport, New York 14105 Phone (716) 735-3616
Sampler Intake:	End of 7.6m (25 ft) long suction tube installed to suit by user.
Gathering Method:	Suction lift from finger-type peristaltic pump.
Sample Lift:	5.5m (18 ft) maximum lift with 0.64cm (1/4 in.) tubing; 3m (10 ft) with 0.95 cm (3/8 in.) tubing; 1.5m (5 ft) with 1.3 cm (1/2 in.) tubing.
Line Size:	0.64 cm (1/4 in.) I.D. standard. Also available in 0.5 cm (3/16 in.), 0.95 cm (3/8 in.), or 1.3 cm (1/2 in.) I.D.
Sample Flow Rate:	80 mℓ per minute; other flows depending on tubing size. Model WAC-5R is 13 mℓ per minute at maximum signal.
Sample Capacity:	Adjustable size aliquots are composited in a 19ℓ (5 gal) sample container. Aliquots for Models WAP-5, WAP-5R and WDP-5 are to 40 mℓ. For Models WAPP-5, WAPP-5R and WDPP-5, aliquot is 640 mℓ, and for Model WAC-5R, flow is continuous.
Controls:	Models WAP-5, WAP-5R, and WDP-5 vary the number of samples in response to a varying signal from a user supplied transmitter. The units will deliver a 30-second sample every 4 minutes at maximum signal strength, every 8 minutes at one-half strength, etc.

	Models WAPP-5, WAPP-5R, and WDPP-5 respond to a switch closure from an external flowmeter and take an adjustable size aliquot. Model WAC-5R varies flow rate in proportion to strength of external signal.
Power Source:	Models WAP-5, WAP-5R, WAPP-5, WAPP-5R and WAC-5R operate on 115 VAC. Models WDP-5 and WDPP-5 operate on 115 VAC or 12 VDC and are equipped with a wet type lead-acid battery (35 amp-hours capacity) and charger.
Sample Refrigerator:	None. Models WAP-5R, WAPP-5R and WAC-5R have an automatic refrigeration unit for cooling sample compartment.
Construction Materials:	Sample train is tygon and polyethylene. Case is fiberglass.
Basic Dimensions:	Models WAP-5, WAPP-5, WDP-5, and WDPP-5 are 51 x 37 x 64 cm (20x14.5x25 in.); Models WAP-5R, WAPP-5R, and WAC-SR are 53 x 56 x 124 cm (21x22x49 in.). Weights are WAP-5 and WAPP-5 18.6 kg (42 lbs), WDP-5 and WDPP-5 27.2 kg (60 lbs), WAP-5R, WAPP-5R, and WAC-5R 44.4 kg (98 lbs); all portable.
Base Price:	WAP-5 $850, WAP-5R $1,100 WAPP-5 $780, WAPP-5R $1,080 WDP-5 $$1,050, WDPP-5 $ 980 WAC-5R $1,215
General Comments:	Models WAP-5, WAPP-5, WDP-5 and WDPP-5 come with 3m (10 ft) of 3-wire retractable cord. Models WAP-5R and WAPP-5R come with 1.8 cm (6 ft) of 3-wire cord. Charge time for battery-operated models is 3-1/2 to

4-1/2 hours. A winterizing kit is available for Models WAP-5, WAPP-5, WDP-5 and WDPP-5 at $95 for effective operation to temperatures of -23°C (-10°F). A stainless steel strainer-anchor intake is available at $15 to prevent plugging of sampling tubes. Model WAC-5R is a continuous sampler with flow rate directly proportional to a 4-20 milliamp input signal.

Sigmamotor Model WAP-5 Evaluation

1. Obstruction or clogging will depend upon user installation of intake line, and use of the optional strainer intake. The unobstructed sampling line and the peristaltic pump should tolerate solids fairly well.

2. Obstruction of flow will depend upon user mounting of intake line and/or use of optional strainer intake.

3. Should operate reasonably well under all flow conditions, but fairly low intake velocity could affect representativeness of sample at high flow rates.

4. Movement of solids within the fluid flow should not affect operation adversely.

5. No automatic starter; no self-cleaning or purging feature.

6. Unit takes composite samples paced by an external flowmeter.

7. Unit does not appear suitable for collecting either floatable or coarser bottom solids.

8. Unit offers reasonable sample protection from damage and deterioration. Models WAP-5R, WAPP-5R and WAC-5R have refrigerator units to store samples.

9. Models WAP-5, WAPP-5, WDP-5 and WDPP-5 appear capable of manhole operation.

10. Unit cannot withstand total immersion.

11. Unit cannot withstand freezing ambients unless winterized.

12. Lift capacity will depend upon tubing size. All but the refrigerated models will pass through a standard manhole.

Designation:	SIGMAMOTOR MODEL WM-5-24
Manufacturer:	Sigmamotor, Inc. 14 Elizabeth Street Middleport, New York 14105 Phone (716) 735-3616
Sampler Intake:	End of 7.6m (25 ft) long suction tube installed to suit by user.
Gathering Method:	Suction lift from finger-type peristaltic pump.
Sample Lift:	5.5m (18 ft) maximum lift with 0.64 cm (1/4 in.) tubing; 3m (10 ft) lift with 0.95 cm (3/8 in.) tubing; and 1.5m (5 ft) lift with 1.3 cm (1/2 in.) tubing.
Line Size:	0.64 cm (1/4 in.) I.D. standard. Also available in 0.5 cm (3/16 in.), 0.95 cm (3/8 in.), and 1.3 cm (1/2 in.) I.D.
Sample Flow Rate:	80 mℓ per minute.
Sample Capacity:	Unit takes 24 discrete 450-mℓ samples.
Controls:	Sampling frequency adjustable from one every ten minutes to one every hour.
Power Source:	115 VAC for Model WM-5-24 and WM-5-24R; 12 VDC or 115 VAC for Model WM-6-24, which comes with a wet-type lead acid battery (35 amp hours capacity) and charger.
Sample Refrigerator:	None. Model WM-5-24R has an automatic refrigeration unit for cooling sample compartment.
Construction Materials:	Sample train is tygon and polyethylene; case is fiberglass.

Basic Dimensions: Models WM-5-24 and WM-6-24 are 51 x 37 x 64 cm (20x14.5x25 in.); Model WM-5-24R is 53 x 56 x 150 cm (21x22x59 in.). Weights are: WM-5-24 20.0 kg (44 lbs), WM-6-24 27.2 kg (60 lbs), WM-5-24R 56.7 kg (125 lbs); portable.

Basic Price:

WM-5-24	$1,225.
WM-6-24	$1,325.
WM-5-24R	$1,775.

General Comments: A 3m (10 ft) length of 3-wire retractable power cord is supplied with Models WM-5-24 and WM-6-24; 1.8m (6 ft) of 3-wire power cord is supplied for Model WM-5-24R. At the end of each cycle, the pump automatically reverses, purging the sample line and tending to make each sample completely discrete. Sample line feeds into a funnel attached to a rotating nozzle which is automatically positioned to fill the next sample container. A one-piece deep-drawn plastic distribution plate is used to route the sample from the nozzle to the containers, which are in a rectangular array. Model WM-6-24 comes with a 6-amp automatic battery charger which adjusts to battery condition automatically. This may be left connected for trickle charge. Charge time is 3-1/2 to 4-1/2 hours. A winterizing kit is available for Models WM-5-24 and WM-6-24 at $95 for effective operation to temperatures of -10°F. A stainless steel strainer-anchor intake is available at $15 to prevent plugging of sampling tubes.

Sigmamotor Model WM-5-24 Evaluation

1. Obstruction or clogging will depend upon user installation of intake line and use of optional strainer intake. The unobstructed sampling line and the peristaltic pump should tolerate solids fairly well.

2. Obstruction of flow will depend upon user mounting of intake line and/or use of the optional strainer intake.

3. Should operate reasonably well under all flow conditions; however, fairly low intake velocity could affect representativeness of sample at high flow rates.

4. Movement of solids within the fluid flow should not affect operation adversely.

5. No automatic starter; at the end of each cycle the pump automatically reverses, purging the sample line to help prevent cross-contamination.

6. Unit takes 24 discrete samples at preset time intervals paced by a built-in timer and deposits them in individual containers.

7. Unit does not appear suitable for collecting either floatables or coarser bottom solids.

8. Unit offers reasonable sample protection from damage and deterioration. Model WM-5-24R has a refrigeration unit to maintain samples at a preset temperature.

9. Models WM-5-24 and WM-6-24 appear capable of manhole operation. Model WM-5-24R does not.

10. Unit cannot withstand total immersion.

11. Unit cannot withstand freezing ambients unless winterized.

12. Lift capacity will depend upon tubing size. All but the refrigerated model will pass through a standard manhole.

Designation:	SIRCO SERIES B/ST-VS
Manufacturer:	Sirco Controls Company 8815 Selkirk Street Vancouver, B.C. Phone 261-9321
Sampler Intake:	Weighted end of 7.6m (25 ft) sampling tube installed to suit by user. May also sample from 2 or 3 different points.
Gathering Method:	Suction lift by vacuum pump.
Sample Lift:	Up to 6.7m (22 ft) vertical and 30.5m (100 ft) horizontal.
Line Size:	0.95 cm (3/8 in.) I.D. standard, larger sizes available.
Sample Flow Rate:	Up to 12 ℓps (3.2 gpm) depending upon lift.
Sample Capacity:	Sample volume is adjustable between 10 to 1000 mℓ (repeatable to within ±0.5 mℓ); either composited in 7.6, 11.4, or 18.9ℓ (2, 3, or 5 gal) jars or sequential or discrete in either 12 or 24 jars of either 1/2 or 1 liter capacity.
Controls:	"Metermatic" chamber (adjustable) controls sample volume. Available with built-in timer for preset time inteveral (3 min to 45 hr) sampling or for connection to external flowmeter for flow proportional sampling or both. Purge timer, automatic jar full shut-off.
Power Source:	Either 110 VAC or 12 VDC level zinc or nickel cadmium battery or combination.
Sample Refrigerator:	Available with thermostatically controlled refrigerated sample compartment.

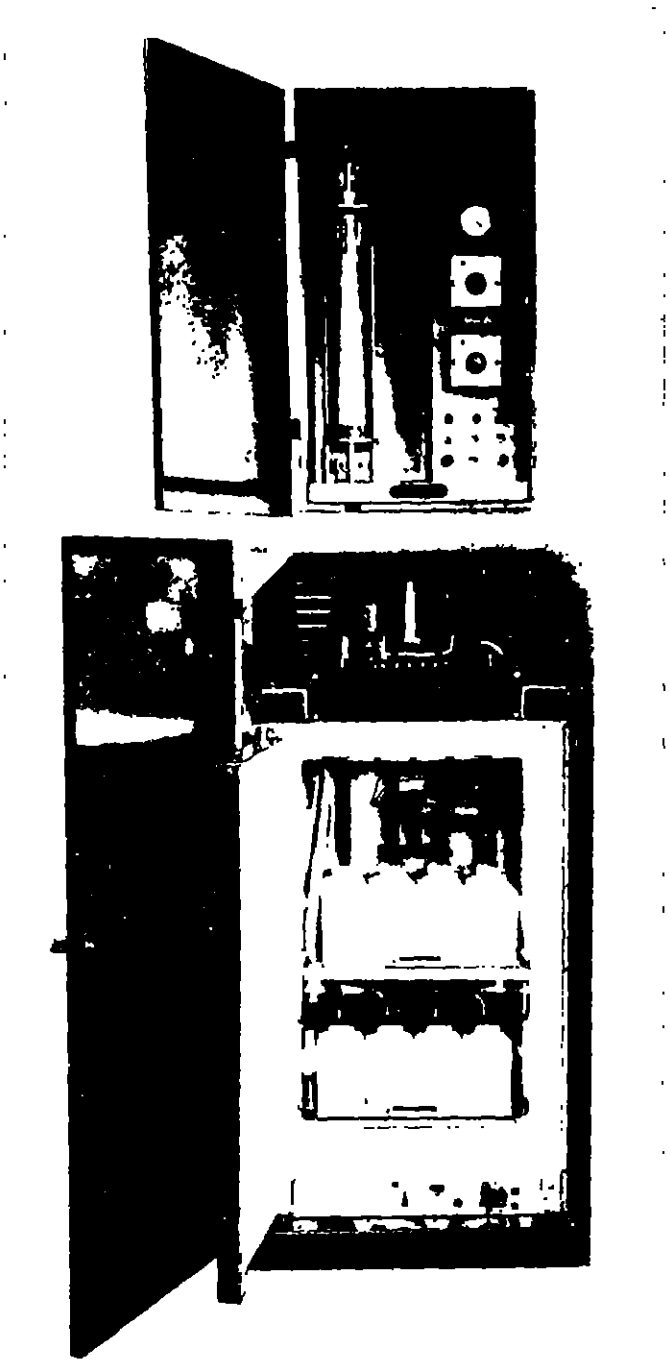

Figure 15. Sirco Series B/ST-VS Sampler

Photograph courtesy of Sirco Controls Company

Construction Materials: PVC sampling tube, weatherproof steel enclosure standard; all stainless steel construction available.

Basic Dimensions: Sampler only - 41 x 36 x 81 cm (16 x 14 x 32 in.), weighs 45 kg (100 lbs); Sampler with container - 41 x 36 x 163 cm (16 x 14 x 64 in.) weighs 68 kg (150 lbs); Refrigerated model - 58 x 71 x 152 cm (23 x 28 x 60 in.), weighs 91 kg (200 lbs); designed for fixed installation.

Base Price: Varies, depending upon what combination of features are desired, from under $1,900 to over $3,000.

General Comments: Signal from flowmeter or timer starts vacuum/compressor pump as well as purge timer. Compressor side of pump purges sample pick-up tube until purge timer times out. Sequence changes and vacuum side of pump evacuates metering chamber and draws sample in to the desired capacity. After obtaining the desired amount of sample, the compressor side of pump is used to forcibly discharge sample from metering chamber into sample collector.

Should plugging of the sample pick-up tube occur, an automatic timer switch uses the compressor side to blow out the tube. This sequence repeats itself as often as needed to obtain the exact amount of sample required. Purging also takes place before and after each sample is taken.

Manufacturer states this unit is especially designed to sample untreated raw sewage or high consistency industrial waste as it is capable of taking solids up to 3/8" in diameter including rags, fibers,

and similar. The only wetted parts are the sample tubing and volume control chamber.

Sirco Series B/ST-VS Evaluation

1. Should be relatively free from clogging due to lack of bends and fittings in sample train and high pressure purging feature.

2. Obstruction of flow will depend upon way user mounts the end of the sampling tube.

3. Should operate well over the entire range of flow conditions.

4. Movement of solids should not hamper operation.

5. Automatic starter available. Power purge serves a self-cleaning function. Cross-contamination should be minimal.

6. Can collect external flowmeter or built-in timer paced samples either discrete, sequential, or composite. Representativeness of sample will depend upon user mounting of intake tube.

7. Unsuitable for collection of floatables or coarser bottom solids without specially designed intake by user.

8. Automatic refrigeration (adjustable temperature) available. Offers good sample protection and freedom from precontamination.

9. Not designed for confined space or manhole operation.

10. Cannot withstand total immersion.

11. Thermostatically controlled heaters and fans are available for applications in freezing ambients.

12. Maximum lift of 6.7m (22 ft) does not place too severe a restriction on use of the unit.

Designation:	SIRCO SERIES B/IE-VS
Manufacturer:	Sirco Controls Company 8815 Selkirk Street Vancouver, B.C. Phone 261-9321
Sampler Intake:	5 cm (2 in.) I.D. guide pipe for sampling cup with perforations in lower end to maximum flow level.
Gathering Method:	Mechanical; a weighted sampling cup is lowered through a guide pipe into the effluent by a hoist mechanism powered by a reversing gear motor. At the upper travel stop the cup empties sample into a sample container by gravity.
Sample Lift:	Up to 61m (200 ft).
Line Size:	Smallest line in sampling train appears to be about 0.95 cm (3/8 in.) tube connecting collection funnel to sample reservoir.
Sample Flow Rate:	Not applicable.
Sample Capacity:	Sample cup has 100 mℓ capacity; either composited in 7.6, 11.4 or 18.9ℓ (2, 3, or 5 gal) jars or sequential in either 12 or 24 jars of either 1/2 or 1 liter capacity.
Controls:	Available with built-in timer for pre-set time interval sampling or for connection to external flowmeter for flow proportional sampling or both.
Power Source:	Either 110 VAC or 12 VDC lead zinc or nickel cadmium battery or combination.
Sample Refrigerator:	Available with thermostatically controlled refrigerated sample compartment.

Construction Materials:	PVC sampling cup and guide tube, weatherproof steel enclosure standard; all stainless steel construction available.
Basic Dimensions:	About 0.6 x 0.6 x 1.5m (2 x 2 x 5 ft); designed for fixed installation.
Base Price:	Varies from under $1,500 to around $3,000 depending upon features desired.
General Comments:	This unit was designed for high lift applications. According to the manufacturer it is not recommended for high consistency industrial effluent or raw sewage where large pieces of fiber, rags papers, etc. are present.

Sirco Series B/IE-VS Evaluation

1. Cup in guide pipe appears susceptible to sticking and clogging. Guide pipe perforations are vulnerable to obstruction and clogging.

2. The 5 cm (2 in.) inside diameter guide pipe must pass completely through the flow stream to be sampled presenting a serious rigid obstruction to flow.

3. Does not appear capable of uniform operation over full range of flow conditions.

4. Solids could collect in guide pipe and hamper cup travel.

5. No automatic starter. No self cleaning features.

6. Can collect flowmeter or timer paced samples either sequential or composite. Representativeness of sample will be dependent upon conditions at end of guide tube but appear highly variable and questionable.

7. Not suitable for collection of floatables or coarser bottom solids.

8. Automatic refrigerator (adjustable temperature) available. Offers good sample protection but vulnerable to cross contamination in sequential mode.

9. Not designed to operate in manholes.

10. Cannot withstand total immersion.

11. Thermostatically controlled heaters and fans are available for applications in freezing ambients.

12. 61m (200 ft) lift gives this unit virtually unrestricted use.